Equações de Euler	Relações Trignométricas	Números Complexos
$e^{j\theta} = \cos\theta + j\sin\theta$ $\cos\theta = \frac{e^{j\theta}+e^{-j\theta}}{2}$ $\sin\theta = \frac{e^{j\theta}-e^{-j\theta}}{j2}$	$\cos(\alpha\pm\beta) = \cos(\alpha)\cos(\beta) \mp \sin(\alpha)\sin(\beta)$ $\sin(\alpha\pm\beta) = \sin(\alpha)\cos(\beta) \pm \cos(\alpha)\sin(\beta)$ $\cos(\alpha)\cos(\beta) = \frac{1}{2}\cos(\alpha+\beta) + \frac{1}{2}\cos(\alpha-\beta)$ $\sin(\alpha)\sin(\beta) = \frac{1}{2}\cos(\alpha-\beta) - \frac{1}{2}\cos(\alpha+\beta)$ $\sin(\alpha)\cos(\beta) = \frac{1}{2}\sin(\alpha+\beta) + \frac{1}{2}\sin(\alpha-\beta)$ $\cos^2\alpha + \sin^2\alpha = 1$ $\cos^2(\alpha) = \frac{1}{2}\left(1+\cos(2\alpha)\right)$ $\sin^2(\alpha) = \frac{1}{2}\left(1-\cos(2\alpha)\right)$ $\cos(2\alpha) = 2\cos^2\alpha - 1 = 1 - 2\sin^2\alpha$	$C = a + jb = re^{j\theta}$ $r = \sqrt{a^2+b^2}$; $\theta = \arctan\frac{b}{a}$ $a = r\cos\theta$; $b = r\sin\theta$ $C^H = a - jb = re^{-j\theta}$ $CC^H = r^2$

Espaço de Sinais	Decomposição de um sinal (par ímpar)	
$y(t) = \sum_{i=1}^{N} a_i x_i(t) + e(t)$ se $< x_i(t), x_j(t) >= 0$, $\forall i \neq j$ minimizar o erro quad. médio $a_i = \frac{<y(t),x_i(t)>}{\Vert x_i(t)\Vert^2}$	Sinal par: $x(t) = x(-t)$ Sinal impar: $x(t) = -x(-t)$ $x(t) = x_{par}(t) + x_{impar}(t)$ $x_{par}(t) = \frac{1}{2}\left(x(t)+x(-t)\right)$ $x_{impar}(t) = \frac{1}{2}\left(x(t)-x(-t)\right)$	

	Sinais periódicos	Sinais de Energia
Produto interno: Norma:	$< y(t), x(t) >= \frac{1}{T_0}\int_{T_0} y(t)x(t)dt$ $P_x = \Vert x(t)\Vert^2 =< x(t), x(t) >$	$< y(t), x(t) >= \int_{-\infty}^{+\infty} y(t)x(t)dt$ $E_x = \Vert x(t)\Vert^2 =< x(t), x(t) >$
Série de Fourier	$C_k = \frac{1}{T_0}\int_{T_0} x_P(t)e^{-j2\pi k f_0 t}dt$ $x_P(t) = \sum_{k=-\infty}^{+\infty} C_k e^{j2\pi k f_0 t}$	
Transformada de Fourier	$X_P(f) = \sum_{k=-\infty}^{\infty} C_k\delta(f-kf_0)$ com $C_k = \frac{1}{T_0}X_E(kf_0)$ se $x_P(t) = \sum_{-\infty}^{\infty} x_E(t-kT_0)$	$X_E(f) = \int_{-\infty}^{+\infty} x_E(t)e^{-j2\pi f t}dt$ $x_E(t) = \int_{-\infty}^{+\infty} X_E(f)e^{j2\pi f t}df$

Propriedades	$x(t)$	$X(f) = \mathrm{TF}\{x(t)\}$
Simetrias	$x(t)$ real	$X(f) = X(-f)^H$
	$x(t)$ real e par	$X(f)$ par e real
	$x(t)$ real ímpar	$X(f)$ imaginário ímpar
Linearidade	$\sum_{i=1}^{N} a_i x_i(t)$	$\sum_{i=1}^{N} a_i X_i(f)$
Escalamento	$x(at)$	$\frac{1}{\vert a\vert}X\left(\frac{f}{a}\right)$
	$x(-t)$	$X(-f)$
Deslocamento no tempo	$x(t-t_0)$	$X(f)e^{-j2\pi f t_0}$
	$x(at-b)$	$\frac{1}{\vert a\vert}X\left(\frac{f}{a}\right)e^{-j2\pi f\frac{b}{a}}$
Translacção na frequência	$x(t)e^{j2\pi f_c t}$	$X(f-f_c)$
Modulação	$x(t)\cos(2\pi f_c t)$	$\frac{1}{2}\left(X(f-f_c)+X(f+f_c)\right)$
Dualidade	$y(t) = X(t)$	$Y(f) = x(-f)$
integração	$\int_{-\infty}^{t} x(\lambda)d\lambda$	$\frac{1}{j2\pi f}X(f) + \frac{1}{2}X(0)\delta(f)$
Diferenciação	$\frac{d^n x(t)}{dt^n}$	$(j2\pi f)^n X(f)$
	$t^n x(t)$	$(-j2\pi)^{-n}\frac{d^n X(f)}{df^n}$
	$x(t)^H$	$X(-f)^H$
Multiplicação	$x(t)y(t)$	$X(f) * Y(f)$
	$x(t) * y(t)$	$X(f)Y(f)$
Teorema de Parsevall	$P = \frac{1}{T_0}\int_{T_0}\vert x(t)\vert^2 dt$	$P = \sum_{k=-\infty}^{\infty}\vert C_k\vert^2$
Teorema de Rayleigh	$E = \int_{-\infty}^{\infty}\vert x(t)\vert^2 dt$	$E = \int_{-\infty}^{\infty}\vert X(f)\vert^2 df$
Transformadas de sinais	$A\Pi\left(\frac{t-t_0}{\tau}\right)$	$A\tau\mathrm{sinc}\left(f\tau\right)e^{-j2\pi f t_0}$
	$A\Lambda\left(\frac{t-t_0}{\tau}\right)$	$A\tau\mathrm{sinc}^2\left(f\tau\right)e^{-j2\pi f t_0}$
	A	$A\delta(f)$
	$A\delta(t)$	A
	$A\delta(t-t_d)$	$Ae^{-j2\pi f t_d}$
	$u(t)$	$\frac{1}{j2\pi f} + \frac{1}{2}\delta(f)$
	$A\mathrm{sign}(t)$	$A\frac{2}{j2\pi f}$
	$Ae^{-at}u(t)$	$\frac{A}{a+j2\pi f}$
	$e^{j2\pi f_c t}$	$\delta(f-f_c)$
	$Acos(2\pi f_c t+\theta)$	$\frac{A}{2}e^{j\theta}\delta(f-f_c) + \frac{A}{2}e^{-j\theta}\delta(f+f_c)$
	$Asin(2\pi f_c t+\theta)$	$\frac{A}{2}e^{j(\theta-\frac{\pi}{2})}\delta(f-f_c) + \frac{A}{2}e^{-j(\theta-\frac{\pi}{2})}\delta(f+f_c)$
	$\sum_{-\infty}^{\infty} A\delta(t-kT_0)$	$Af_0\sum_{-\infty}^{\infty}\delta(f-kf_0)$

SLITS	
Resposta do sistema	$y(t) = h(t) * x(t)$
Resposta ao escalão	$g(t) = \int_{-\infty}^{t} h(\lambda) d\lambda$
	$h(t) = \frac{dg(t)}{dt}$
Resposta em frequência	$H(f) = Y(f)/X(f)$
	$H(f) = TF\{h(t)\}$
Resposta em Reg. Estacion.	$x(t) = A\cos(2\pi f_x t + \theta)$
	$y(t) = A\|H(f_x)\| \cos(2\pi f_x t + \theta + arg(H(f_x)))$
SLIT causal	$h(t) = 0 \text{ para } t < 0$
SLIT sem memória	$h(t) = 0 \text{ para } t \neq 0$
SLIT estável	$\int_{-\infty}^{\infty} \|h(t)\| dt < \infty$
operação convolução	
	$z(t) = x(t) * y(t) = \int_{-\infty}^{\infty} x(\lambda) y(t-\lambda) d\lambda$
Propriedades da convolução	
	$x(t) * y(t) = y(t) * x(t)$
	$x(t) * (y(t) * z(t)) = (x(t) * y(t)) * z(t)$
	$x(t) * (ay(t) + bz(t)) = a(x(t) * y(t)) + b(x(t) * z(t))$
	$\frac{d(x(t)*y(t))}{dt} = \frac{d(x(t))}{dt} * y(t) = x(t) * \frac{d(y(t))}{dt}$
	$x(t) * \delta(t - t_0) = x(t - t_0)$
Propriedades do Dirac	
	$\int_{-\infty}^{\infty} A\delta(t - t_0) dt = A$
	$\int_{-\infty}^{t} A\delta(\lambda - t_0) d\lambda = Au(t - t_0)$
	$\frac{dAu(t-t_0)}{dt} = A\delta(t - t_0)$
	$\int_{-\infty}^{\infty} x(t)\delta(t - kt_0) dt = x(t_0)$
	$\delta(at) = \frac{1}{\|a\|}\delta(t)$